HYDAC INTERNATIONAL

Press Safety Valve
PSV 10/16
PSV for mechanical presses/servo presses, type approved according to DIN EN ISO 16092-2

DESCRIPTION

The HYDAC safety valve is used to control the hydraulically actuated brake or clutch, as well as a combination of both (combined clutch/brake unit, KBK), in mechanical or servo presses.

In the event of a failure of one of the position monitored valves, the HYDAC PSV ensures that an unintended start-up of the press plunger is prevented or that a safety related stop of the machine is achieved in accordance with DIN EN ISO 16092-2.

The HYDAC PSV is available in the nominal sizes 10 and 16 and has an EC type test certificate.

In a corresponding application and if used in combination with a safety PLC, the hydraulic control system is suitable for fulfilling the requirements of performance level PL e and category 4 in acc. with DIN EN ISO 13849 for the safety function “safety related stop function and prevention of unintentional start-up”.

CHARACTERISTICS

- The hydraulic control system meets the requirements of DIN EN ISO 16092-2
- Safety component with type test certificate in acc. with Directive 2006/42/EC
- Straightforward and robust control system
- Requires minimal space, piping and maintenance
- Rapid on/off switching time
- Composed of standard components

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MODEL CODE

PSV 10 - X01 - A1 P1 - 24 D G / V

Description
PSV = Press Safety Valve

Nominal size (NS)
10
16

Series
X01 = without accumulator safety valve (standard)
X02 = with accumulator safety valves

Pressure sensing in A
= without pressure sensor, with gauge port 1/4"
A1 = pressure transmitter 4 - 20 mA
A2 = pressure transmitter 0 - 10 V
A4 = pressure switch with two switching contacts and analogue output

Pressure sensing in P
= without pressure sensor, with gauge port 1/4"
P1 = pressure transmitter 4 - 20 mA
P2 = pressure transmitter 0 - 10 V
P4 = pressure switch with two switching contacts and analogue output

Rated voltage of the solenoid coil
24 = 24 volts DC
110 = 110 Volt AC

Type of voltage
D = DC
A = AC

Plug connector
G = plug connector, DIN EN 175301-803 A

Seal material
V = FKM (standard)

FUNCTION

The two position monitored valves, no. 70.1 and 70.2, connected in parallel, ensure that performance level PLe and category 4 in acc. with DIN EN ISO 13849 can be achieved for the safety function “safety stop and prevention of unintented start-up” in combination with a safety PLC.

Additionally, the pump-side sequence valve no. 20 prevents the pump or an accumulator from conveying oil into the system while the brake or clutch is discharging. This shortens the switch off time of the machine to reach the safe position.

Optionally, the HYDAC PSV can be equipped with additional safety valves. If an accumulator is used, the accumulator safety valves (no. 30, 40, 60) are essential and must be integrated.

If desired, the HYDAC PSV can also be equipped with pressure sensors for coupling, brake, pump and accumulator (see section “Combinations”).

The HYDAC PSV can be mounted either to a mounting plate or to the clutch/brake itself, or connected directly at the threaded connections. In case of direct pipe connection, a subplate must be used.

Can be expanded to create a complete system:

For mechanical presses with coupling-brake combinations (CBC), the HYDAC PSV can be expanded with additional control modules for soft braking and soft coupling. See data sheet DE 10.146.12.0.

Please also refer to the section **„Schematic design“.**

Available variants

- Nominal sizes 10 and 16
- With or without accumulator safety valves
- Different voltage variants
- Pressure sensing at the pump or accumulator and the coupling/brake

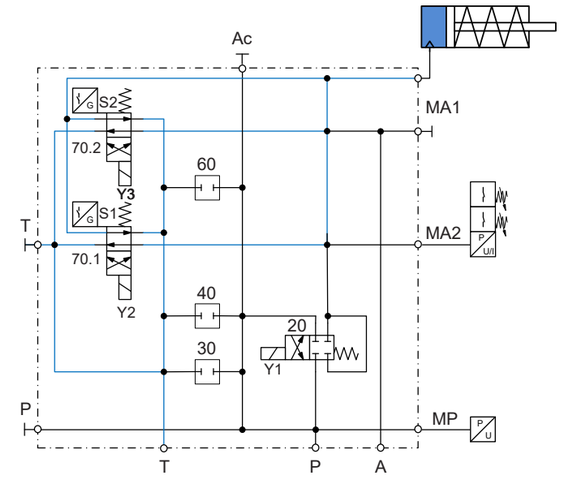
DETAILED DESCRIPTION OF FUNCTION

PSV in starting position | brake applied

Example: PSV 10-X01-A4P2-24DG/V

In the starting position, sequence valve no. 20 is closed, so the pump is not connected to the system. Both switch-position-monitored valves nos. 70.1 and 70.2 are in the safe starting position. The circuit of the PSV is designed in such a way that when the two valves are in this position, port A is relieved to the tank. The spring assembly of the braking cylinder therefore pushes the oil to the tank via the two valves, and the brake is applied. Fluid passes through the two valves 70.1 and 70.2 in duplicate in order to generate the lowest possible pressure loss and thus relieve a high flow rate to the tank.

The two limit switches S1 and S2 notify the safety controller that the two valves 70.1 and 70.2 are in the safe starting position and that the brake is therefore applied.

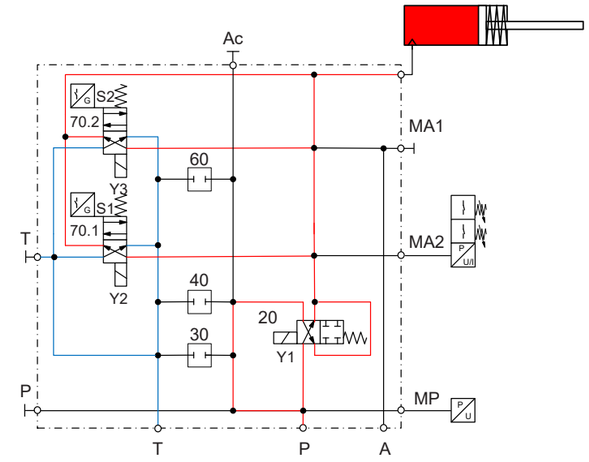


PSV in switched position | brake released

Example: PSV 10-X01-A4P2-24DG/V

To release the brake, the solenoids Y2 and Y3 of the switching-position-monitored valves nos. 70.1 and 70.2 need to be switched. This will close the connection from A to the tank. The solenoid Y1 of pressure switching valve no. 20 is then actuated, the pump conveys fluid into the system and the brake is released. Fluid passes through the sequence valve in duplicate in order to generate the lowest possible pressure loss and thus convey a high flow rate into the brake.

The two limit switches S1 and S2 notify the safety controller that the two valves 70.1 and 70.2 have been switched and that the brake is therefore released.



TECHNICAL DATA[1)]

General specifications

	Nominal size	
	10	**16**
$MTTF_D$	150 - 1200 years, assessment according to DIN EN ISO 13849-1:2016; Table C.1, Confirmation of ISO 13849-2:2013; Tables C.1 and C.2	
Ambient temperature	-20 °C to +60 °C	
Installation position	No orientation restrictions, with accumulator upright	
Weight (without accumulator)	21 kg	35 kg

Hydraulic specifications

	Nominal size	
	10	**16**
Maximum operating pressure	210 bar	210 bar
Maximum flow rate	120 l/min	200 l/min
Maximum pump flow, P channel With accumulator operation	24 l/min	110 l/min
Pressure fluid	Hydraulic oil according to DIN 51524 Part 1 to 3 and lubricating oil CLP DIN 5157-3	
Temperature of operating fluid	Min. –20 °C to max. +80 °C	
Operating fluid viscosity range	Recommendation: min. 10 mm^2/s up to 350 mm^2/s, max. permissible 500 mm^2/s. **Notice:** Using a higher viscosity fluid than recommended will prolong the time required to release the coupling or brake. Hence, if using a higher viscosity fluid, this will need to be tested.	
Cleanliness class according to DIN ISO 4406	Class 20/18/15 or cleaner	

Electrical technical specifications

Nominal voltage	24 V DC ± 10 % 110 V AC ± 10 %
Protection class	IP 65 according to DIN EN 60529 (when installed correctly)
Electrical connection Solenoid valve	Plug connector to EN 175301-803 (DIN 43650) Not included in the scope of delivery
Electrical connection Switch position monitoring and sensors	Plug connector M12x1, 4-pole, A coding Plug connector M12x1, 5-pole, A coding Not included in the scope of delivery

[1)] see “Conditions and Instructions for Valves” in brochure 53.000

The switch-position-monitored valves nos. 70.1 and 70.2 installed in the press safety valves are preset and sealed. The limit switches of these valves must not be adjusted or tampered with.

RESPONSE TIMES

Response times

The response times are defined as the time period between the electric voltage signal and the first pressure change in port A.

Size 10 = 42 ms

Size 16 = 36 ms

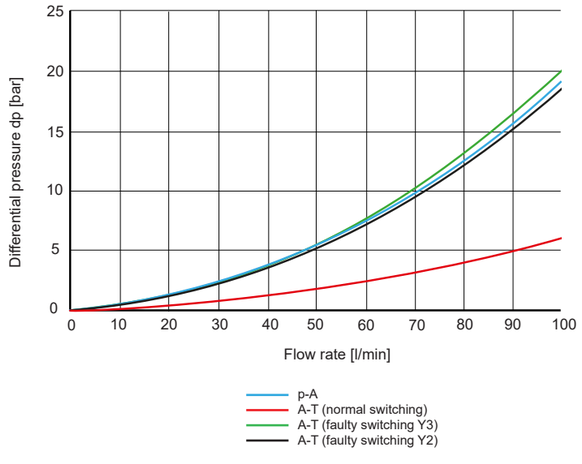
Switch-off times:

Please refer to page 11 for detailed information about the switch-off times.

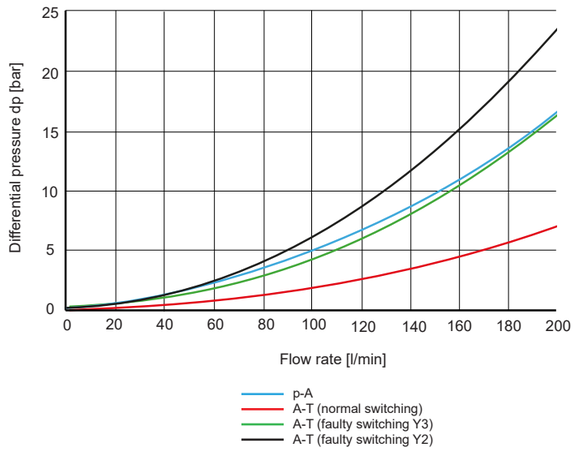
PERFORMANCE CURVES

dp-Q characteristics measured atν = 46 mm^2/s, T_{Oil} = 40 °C

Size 10



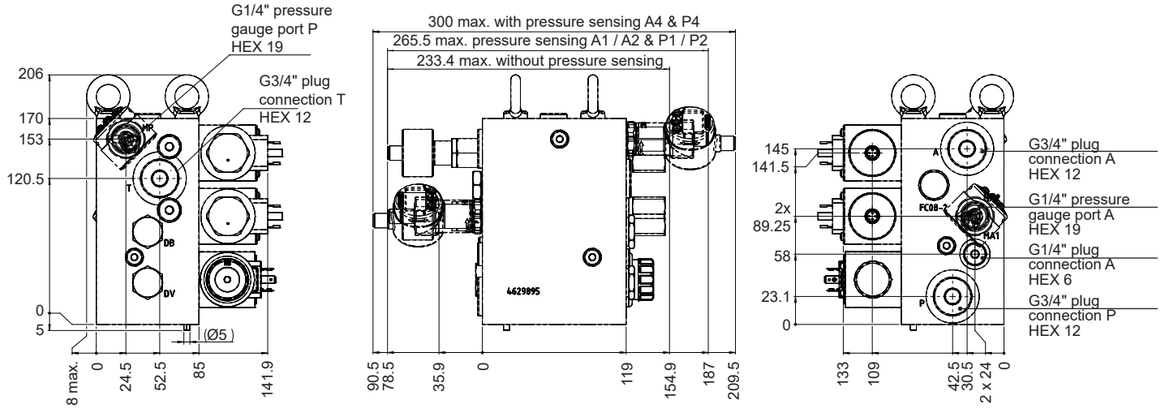
Size 16

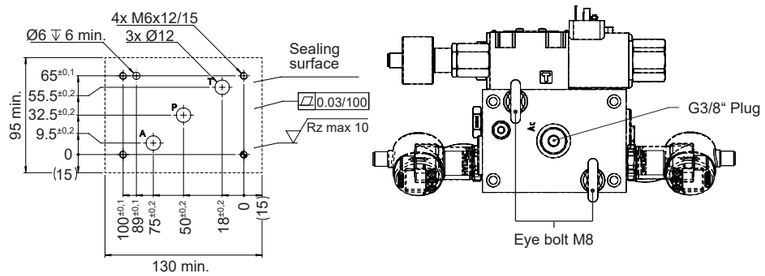


DIMENSIONS, HYDRAULIC PORTS SIZE 10

Size 10

Ports A, P and T on the underside of the PSV correspond to Herion interface, nominal size 10.

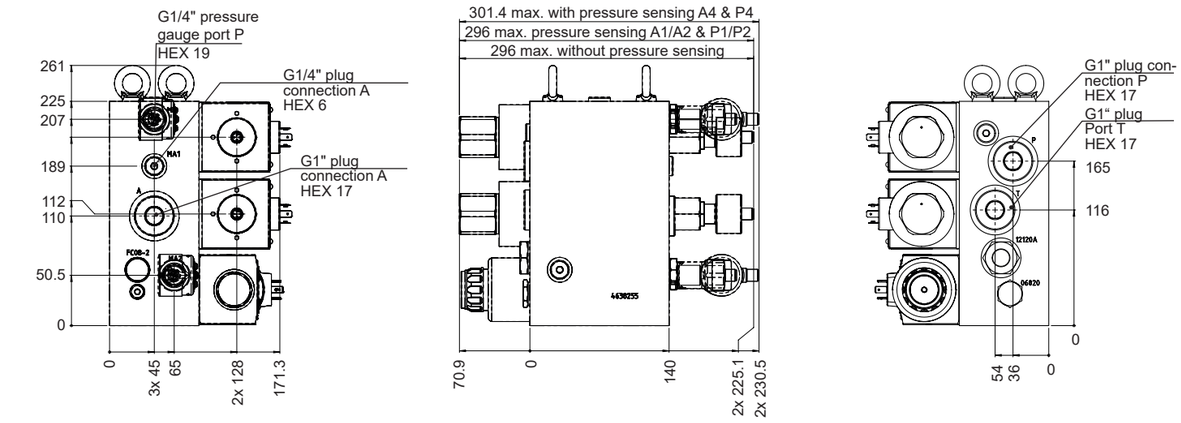


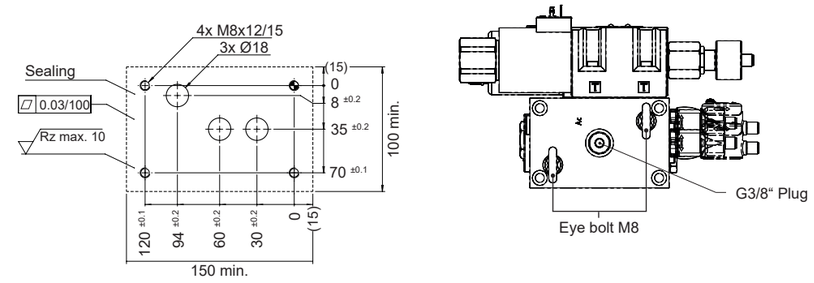


DIMENSIONS, HYDRAULIC PORTS SIZE 16

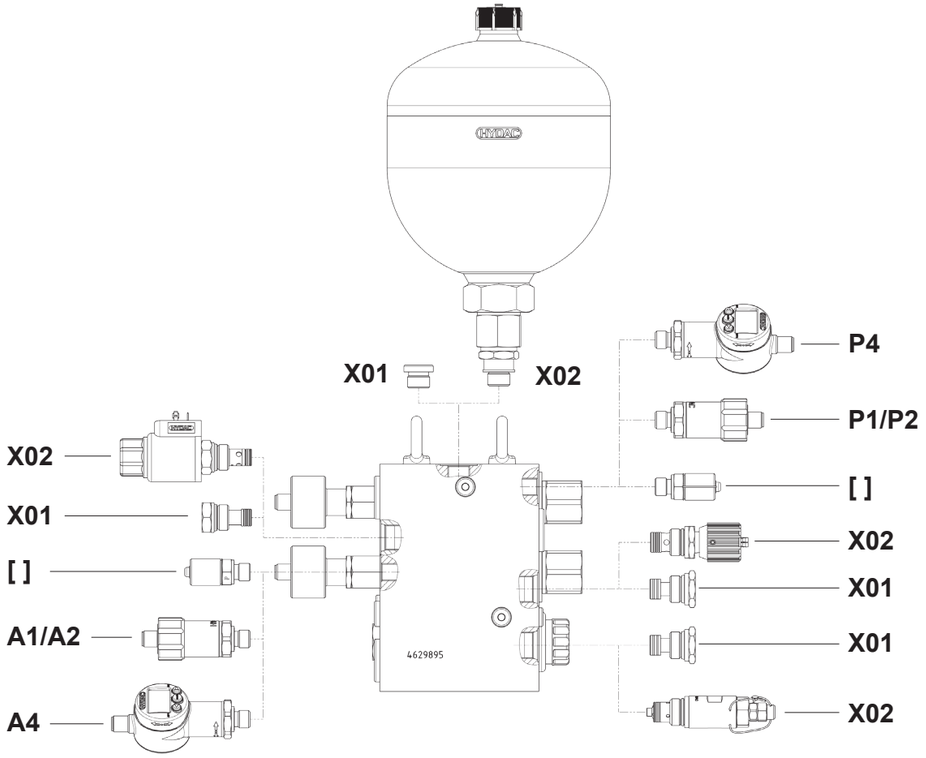
Size 16

Ports A, P and T on the underside of the PSV correspond to Herion interface, nominal size 16.



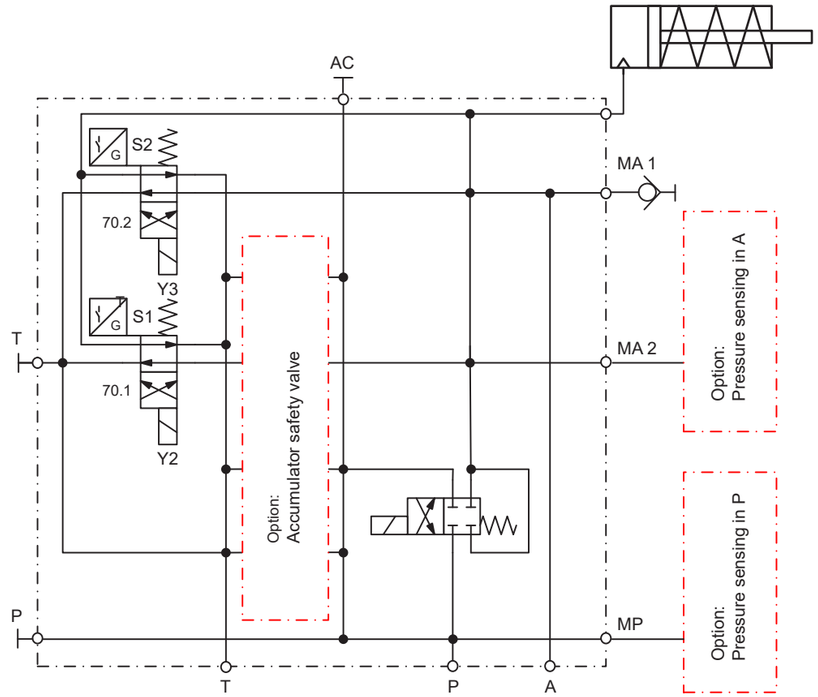


SCHEMATIC DIAGRAM



SCHEMATIC DESIGN

HYDAC PSV includes secure unloading of the CBC/brake and connection of the pump/accumulator. Optionally, the PSV can be equipped with pressure sensing in P and/or in A (nos. 80, 90). If an accumulator is used, the accumulator safety valves (nos. 30, 40, 60) must be integrated.



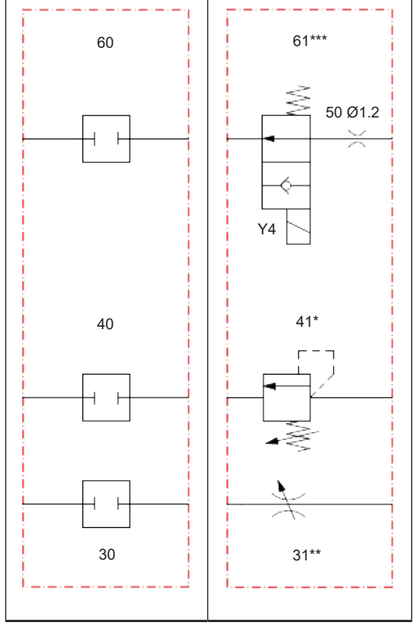
COMBINATIONS

		Designa-tion	X01 / without accumulator	Pressure measurement **without**	Pressure measurement in **P**	Pressure measurement in **A**	Pressure measurement in **P & A**	X02 / with accumulator	Pressure measurement **without**	**Pressure measurement in** P	Pressure measurement in **A**	Pressure measurement in **A & P**
Pressure sensing in **A**	Without pressure sensing, with pressure gauge port					•	•				•	•
	Pressure transmitter (4 - 20 mA) in A	**A1**				•	•				•	•
	Pressure transmitter (0 - 10 V) in A	**A2**				•	•				•	•
	Pressure switch with two switching contacts & analogue output A	**A4**				•	•				•	•
Pressure sensing in **P**	Without pressure sensing, with pressure gauge port				•		•			•		•
	Pressure transmitter (4 - 20 mA) in P	**P1**			•		•			•		•
	Pressure transmitter (0 - 10 V) in P	**P2**			•		•			•		•
	Pressure switch with two switching contacts & analogue output P	**P4**			•		•			•		•

DESCRIPTION OF OPTIONS

Optional accumulator safety valve, nos. 30, 40, 50 and 60
If an accumulator is used for remote brake control, the PSV needs to be fitted with accumulator safety valves:

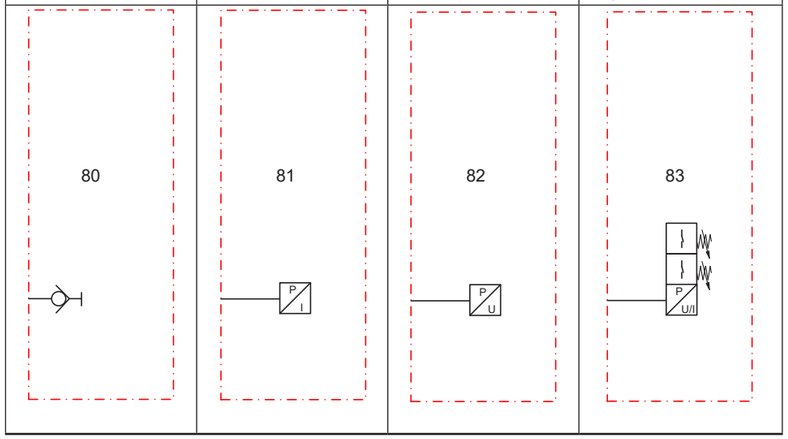
Series **X01 without valves**	Series **X02 with valves** Please refer to page 11 for detailed safety information



Option accumulator safety valves, nos. 80 to 83
Pressure sensing in A, nos. 80 to 83

For electrical monitoring of the brake pressure, the PSV can be equipped with pressure sensing in A:

Series " " without pressure sensing	Series **A1** Pressure transmitter with current output	Series **A2** Pressure transmitter with voltage output	Series **A4** Pressure transmitter with two switching points and analogue output



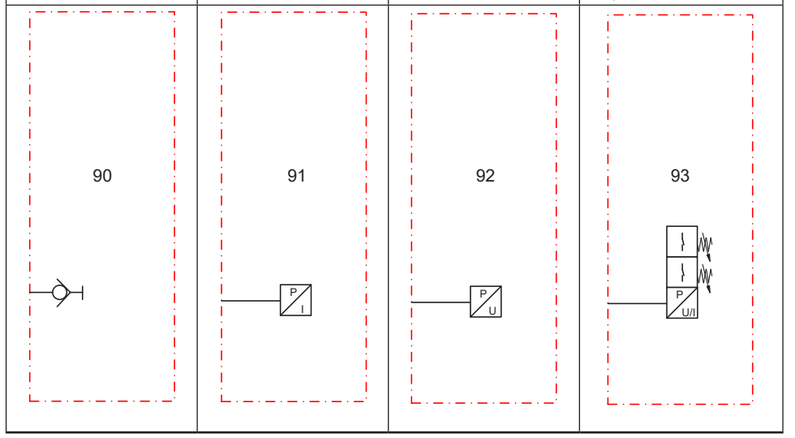
The pressure relief valve no. 41 is preset and sealed and must not be tampered with.

* For more information about pressure relief valve no. 41, please refer to brochure DE 5.163.14/02.23 (NS10) and DE 5.169.10/02.23
** For more information about throttle valve no. 31, please refer to brochure DE 5.113.8/06.19
*** For more information about relief valve no. 61: please refer to brochure DE 5.917.2/11.18 (NS10 & NS16)

Please refer to the technical data on page 4 for information on permissible pump flow rates.

Pressure sensing in P, nos. 90 to 93
For electrical monitoring of the pump pressure or for accumulator charging function, the PSV can also be fitted with pressure sensing in P.

Series " " without pressure sensing	Series **P4** Pressure transmitter with current output	Series **P4** Pressure transmitter with voltage output	Series **P4** Pressure transmitter with two switching points and analogue output



COMBINATIONS

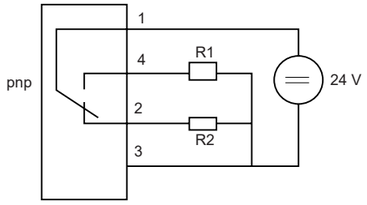
		Designa-tion	X01 / without accumulator: Pressure measurement **without**	Pressure measurement in **P**	Pressure measurement in A	Pressure measurement in **P & A**	X02 / with accumulator: Pressure measurement **without**	Pressure measurement in P	Pressure measurement in A	Pressure measurement in **A & P**
Without accumulator safety valve	Plug	**30**	●	●	●	●				
	Plug	**40**	●	●	●	●				
	Plug	**60**	●	●	●	●				
With accumulator safety valve	Throttle valve	**31**					●	●	●	●
	Pressure relief valve	**41**					●	●	●	●
	2/2 directional valve	**61**					●	●	●	●
Pressure measurement in **A**	Pressure gauge port	**80**			●	●			●	●
	Pressure transmitter (4 - 20 mA) in A	**81**			●	●			●	●
	Pressure transmitter (0–10 V) in A	**82**			●	●			●	●
	Pressure switch with two switching contacts & analogue output A	**83**			●	●			●	●
Pressure measurement in **P**	Pressure gauge port	**90**		●		●		●		●
	Pressure transmitter (4–20 mA) in P	**91**		●		●		●		●
	Pressure transmitter (0–10 V) in P	**92**		●		●		●		●
	Pressure switch with two switching contacts & analogue output P	**93**		●		●		●		●

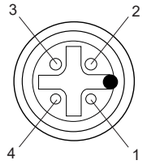
SWITCH POSITION MONITORING

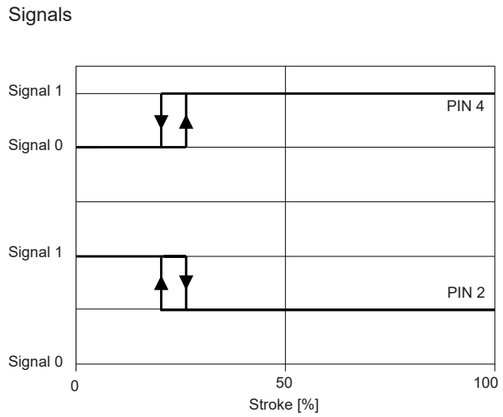
Electrical characteristics – inductive limit switch IES 2010	
Supply voltage	20–32 V DC
Current consumption	400 mA
Max. output current	400 mA
Output signal	2 PNP
EMC	DIN EN 61000-6-1/2/3/4
Connector	M12x1 according to DIN 40050

Nos. 70.1 and 70.2 terminal connections – brochure valve 4WER06 DE 5.249.31.1

Terminal connections of the positional transducer



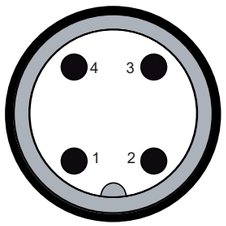




Pin	Value	Function
1	+24 V	Supply voltage
2	NC	Normally closed
3	0 V	-
4	NO	Normally open

PRESSURE SENSOR / MONITOR

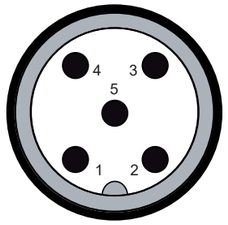
Pressure transmitter HDA 4746 terminal connections (brochure DE 18.306.5).



M12x1, 4-pole

Pin	HDA 4746-A	HDA 4746-B
1	Signal +	$+U_B$
2	n.c.	n.c.
3	Signal -	0 V
4	n.c.	Signal

Pressure switch EDS 3448 terminal connections (brochure DE 18.060.4).



M12x1, 5-pole

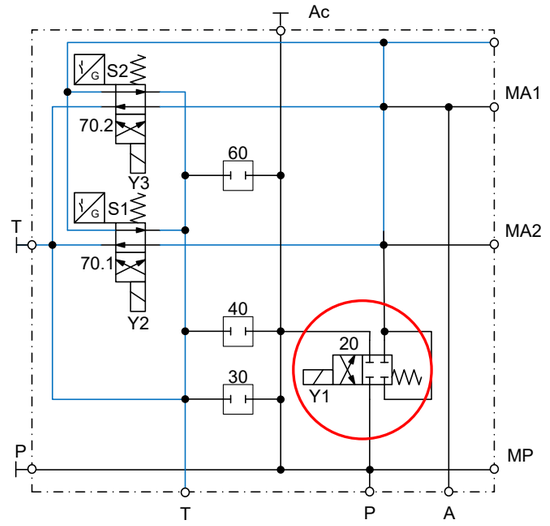
Pin	EDS 3448-5-0100-000
1	$+U_B$
2	Analogue
3	0 V
4	SP 1
5	SP 2

SWITCH-OFF TIME

The total switch-off time for releasing the brake or clutch depends on the hydraulic and mechanical system's design and dimensions (e.g. hydraulic accumulator, pump, spring force, oil purity, pressure, volume, etc.).

If valve Y1 is not actuated correctly, it might take longer for the pressure in consumer line A to be reduced, which could prolong overrun travel. Hence, the distributor of the machine is responsible for taking into account the incorrect actuation of the valve when measuring overrun and when defining the associated safety distance.

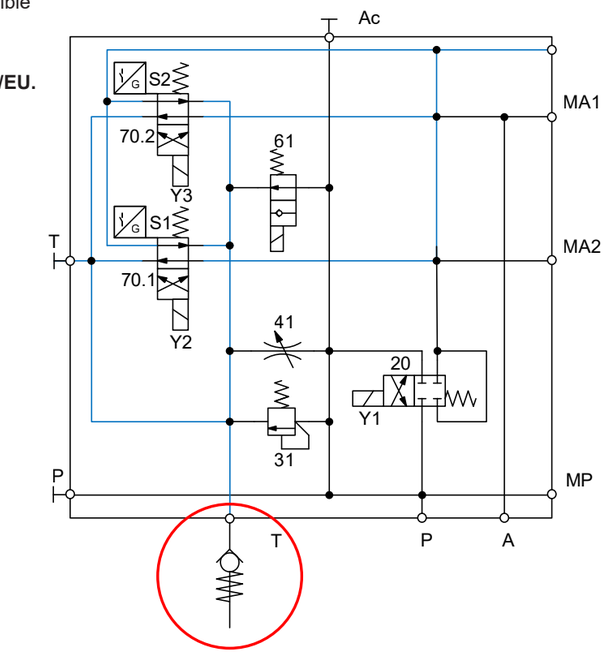
Please also refer to DIN EN ISO 16092-2.



DETAILS FOR OPTION SERIES X02

When using series X02 accumulator safety vales, it is not possible to install a non-return valve in line T.

Please also refer to Pressure Equipment Directive 2014/68/EU.



ACCESSORIES

If the PSV is not mounted directly to the side pipe connection screw joints, the flange side must be closed up with a mounting plate.

PSV10

NG10	Designation	Part no.
Fastening screw set (4 pcs.)	Fastening screws PSV10	4745259
Seal kit size 10 (3 pcs.)	Material: FKM	4746582
Mounting plate, size 10	Mounting plate SO-BL PSV NG10	4630161
Switch-position-monitored valve	4WER0 6 C S01-24DG/V	4675006
Fastening screw set, valve (4 pcs.)	Ch.-hd. scr. ISO4762-M 5x 30-10.9	3524313
Pump-side pressure switching valve	4WE 6 EA A01-24DG/V/M2	4169784
Fastening screw set, valve (4 pcs.)	M5 x 50 - 10.9, DIN EN ISO 4762	4312231
Seal kit, valve (4 pcs.)	9.25 x 1.78 80-FKM-80Sh	3120269

PSV16

NG16	Designation	Part no.
Fastening screw set (4 pcs.)	Fastening screws PSV16	4711450
Seal kit size 16 (3 pcs.)	Material: FKM	4746583
Mounting plate size 16	Mounting plate SO-BL PSV NG16	4638256
Switch-position-monitored valve	4WER0 10 C S01-24DG/	4687774
Pump-side pressure switching valve	4WE 10 EA A01-24DG/V	4293715
Fastening screw set, valve (4 pcs.)	M6 x 40 - 10.9, DIN EN ISO 4762	3524314
Seal kit, valve (4 pcs.)	12.42 x 1.78-FKM-80Sh	4348705

Sensors

NS10 & NS16	Designation	Part no.
Pressure switch	EDS 3448-5-0100-000	908162
Pressure transmitter (4 - 20 mA)	HDA 4746-A-100-000	908947
Pressure transmitter (0 - 10 mA)	HDA 4746-B-100-000	908238

NOTE

The information in this brochure relates to the operating conditions and fields of application described. For applications and operating conditions not described: please contact the relevant technical departments.

Subject to technical modifications.

Documents are only valid if they have been obtained via the website and are up-to-date.

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